

THE INVERTEBRATE ASSEMBLAGE OF SOME ARABLE FIELDS IN WEST CORNWALL: A MISMATCH BETWEEN INVERTEBRATE AND PLANT CONSERVATION PRIORITISATION

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ABSTRACT

The invertebrate fauna of a complex of arable fields is described on the basis of a single day's survey. These fields are well-known to support important arable plant species and are good for farmland birds but the invertebrates had not previously been studied. About 60 species were recorded, mostly Coleoptera and Heteroptera. These include one Red Data Book beetle *Ochrosis ventralis* (Illiger) and eight Nationally Scarce species, most notably another flea beetle *Mantura rustica* (L.) (Chrysomelidae), the weevils *Sirocalodes quercicola* (Paykull) and *Stenocarum ruficornis* (Stephens) (Curculionidae), and the seed bugs *Aphanus rolandri* (L.) and *Scolopostethus pictus* (Schilling) (Lygaeidae). This assemblage is very important in the context of Cornwall and probably of significant interest nationally.

INTRODUCTION

The opportunity arose on 11 July 2003 to investigate the invertebrate fauna of an area of species-rich arable land on the West Pentire headland in Crantock Parish, close to Newquay in west Cornwall (SW7760). Arable plants are known to have been subject to huge decline as a result of 20th century agricultural development (Wilson, 1992). It is assumed that the same is true of arable invertebrate assemblages although this is much less well documented. Donald (1998) comments that there are invertebrates which are restricted largely to farmland, particularly arable land, and many of these formerly common species have declined to such a level that they are now rare and threatened. He provides no examples, however. Some of the best remaining arable habitat is on coastal farmland in Devon and Cornwall (Ford, 2003).

Management of rich arable flora is also good for farmland birds (Ford, 2003) and provides a type of sparsely-vegetated, frequently disturbed habitat that was previously much more widespread in the countryside but which has to a large extent been lost outside arable farmland. Seed of most arable plant species can remain dormant in the soil when the fields are not cultivated, although many of the more uncommon species have seed with limited dormancy periods and require ploughing in order to survive (Wilson, 1992). Arable invertebrates do not have the luxury of such dormancy and may be expected to have been lost to a far greater extent than the plants. So does one of the richest arable plant sites still support an interesting invertebrate fauna?

WEST PENTIRE AND ITS ARABLE PLANTS

The field system at West Pentire comprises eleven arable fields totalling 16 ha, on an exposed headland surrounded by herb rich maritime grassland, or inland by housing. The shallow, freely-draining, loamy acid soils receive significant influence of wind-blown shell sand from the bay below and are accordingly more calcareous than might otherwise be expected from the situation – it is also possible that local farmers

may have in the past brought this lime rich sand up onto the fields deliberately, to sweeten the ground further (I. Kemp, pers. comm.).

The special interest of this site for "arable weeds" has been known for many years, the local abundance of corn marigold *Chrysanthemum segetum* being one of the more eye-catching features. It also has many less obvious rarities such as Venus's-looking-glass *Legousia hybrida*, rough poppy *Papaver hybridum*, shepherd's-needle *Scandix pecten-veneris* and lesser snapdragon *Misopates orontium*. There are also more widespread species such as western ramping-fumitory *Fumaria occidentalis*, night-flowering catchfly *Silene noctiflora* and corn parsley *Petroselinum segetum* (Ford, 2003).

LAND MANAGEMENT

The agricultural tenant had been farming in a somewhat haphazard way since the land was acquired by the National Trust in 1960, the exposure of the headland in particular ensuring that any chemical inputs did not last long. The tenant died in 1989 enabling new arrangements to be developed (Ford, 2003). After a number of attempts to let the farm with herbicide restrictions, the local National Trust managers decided that it was not possible to marry the protection of such an important site with a commercial farming system, and decided to run it "in hand" to ensure the protection of the rare arable plant interest. In 1994 it became the first arable area to be awarded a grant under the Countryside Stewardship Scheme.

Using a local contractor, the fields are cultivated following a detailed plan drawn up in advance between the property staff and a local volunteer botanist. With a comprehensive annual survey, it is possible to give a fairly accurate assessment of the required management of each field. This includes fields which should be spring ploughed, those which should be autumn ploughed and those which should be left fallow to encourage biennials such as corn parsley. In most cases a shallow plough is used. A late light topping and occasional winter grazing have been used to control the amount of vegetation, which was clogging the plough. Initially no crop was sown, but after discussion with RSPB, it was decided to plant a thin crop of barley to act as a winter seed source for the many finches and buntings, which are a feature of the site. This management has resulted in a particularly fine arable plant flora and arable bird assemblage, but no-one had investigated the invertebrate assemblages.

The biggest problem is that of aggressive weeds such as couch grass *Elymus repens*, perennial sow thistle *Sonchus arvensis*, spear thistle *Cirsium vulgare*, creeping thistle *C. arvense* and ragwort *Senecio jacobaea*. The first two tend to suppress many of the rarer species, while the latter three are not popular with local farmers. Trials of small strip applications of glyphosate—a total weed killer—in September have been successful. The herbicide application has subsequently been used every five or so years on a rotational basis. The autumn application appears to only take out the target species while the desirable plants have already set seed. Unfortunately the herbicide use appears to be becoming less successful in controlling couch grass, and changes to the management system are now being considered, including a crop rotation (J.A. Lister, pers. comm.)

THE INVERTEBRATE FAUNA

A full day was spent on site and the main techniques used were standard sweep-netting and hand search. Conditions were ideal for observing insect activity—hot and sunny with a light onshore breeze. Emphasis was placed on certain Coleoptera and

Table 1. Full list of species recorded in arable fields at West Pentire, Cornwall, in July 2003.

Coleoptera		Heteroptera	
Apionidae		Coreidae	
<i>Apion frumentarium</i> (Paykull)		<i>Coreus marginatus</i> (L.)	
Cantharidae		Lygaeidae	
<i>Rhagonycha fulva</i> (Scopoli)		<i>Aphanus rolandri</i> (L.)	N
Carabidae		<i>Megalonotus emarginatus</i> (Rey)	
<i>Harpalus attenuatus</i> Stephens		<i>Scolopostethus pictus</i> (Schilling)	N
<i>Harpalus rufipes</i> (Degeer)		Miridae	
Chrysomelidae		<i>Ascidema obsoleta</i> (Fieber)	
<i>Chaetocnema concinna</i> (Marshall) s. str.		<i>Calocoris norvegicus</i> (Gmelin)	
<i>Gastrophysa polygoni</i> (L.)		<i>Dicyphus globulifer</i> (Fallén)	
<i>Longitarsus kutscherae</i> (Rye)		<i>Orthocephalus saltator</i> (Hahn)	
<i>Longitarsus pellucidus</i> (Foudras)		<i>Stenotus binotatus</i> (Fab.)	
<i>Mantura rustica</i> (L.)	Nb	<i>Trigonotylus rufticornis</i> (Geoffroy)	
<i>Ochrosia ventralis</i> (Illiger)	RDB3	Nabidae	
<i>Phaedon tumidulus</i> (Germar)		<i>Himacerus mirmicoides</i> (Costa, O.)	
<i>Phyllotreta nemorum</i> (L.)		<i>Nabis ferus</i> (L.)	
<i>Psylliodes cuprea</i> (Koch, J.D.W.)		Pentatomidae	
Coccinellidae		<i>Dolycoris baccarum</i> (L.)	
<i>Coccinella 11-punctata</i> L.		<i>Podops inuncta</i> (Fab.)	
<i>Coccinella 7-punctata</i> L.		Rhopalidae	
Curculionidae		<i>Chorosoma schillingi</i> (Schummel)	
<i>Gymnetron rostellum</i> (Herbst)	Na	Stenocephalidae	
<i>Ceutorhynchus minutus</i> (Reich)		<i>Dicranocephalus agilis</i> (Scopoli)	Nb
<i>Ceutorhynchus obstructus</i> (Marshall)		Tingidae	
<i>Ceutorhynchus typhae</i> (Herbst)		<i>Tingis cardui</i> (L.)	
<i>Microplontus rugulosus</i> (Herbst)		Orthoptera	
<i>Rhinoncus pericarpus</i> (L.)		<i>Chorthippus parallelus</i> (Zett.)	
<i>Sirocalodes quercicola</i> (Paykull)	Na	<i>Tetrix undulata</i> (Sowerby)	
<i>Stenocarus ruficornis</i> (Stephens)	Nb	<i>Tettigonia viridissima</i> L.	
<i>Sitona lineatus</i> (L.)		Lepidoptera	
<i>Sitona sulcifrons</i> (Thunberg)		<i>Vanessa cardui</i> (L.)	
<i>Hypera arator</i> (L.)		Diptera	
<i>Hypera nigrirostris</i> (Fab.)		<i>Leptogaster cylindrica</i> (De Geer)	
<i>Hypera ramicis</i> (L.)		<i>Terellia tussilaginis</i> (Fab.)	
Elateridae		Molluscs	
<i>Athous bicolor</i> (Goeze)		<i>Candidula intersecta</i> (Poiret)	
Melyridae		<i>Cochlicella acuta</i> (Müller)	
<i>Psilothrix viridicoeruleus</i> (Fourcroy)		<i>Helix aspersa</i> Müller	
Nitidulidae		<i>Theba pisana</i> (Müller)	
<i>Meligethes aeneus</i> (Fab.)		Woodlice	
Oedemeridae		<i>Armadillidium vulgare</i> (Latreille)	
<i>Oedemera nobilis</i> (Scopoli)		<i>Philoscia muscorum</i> (Scopoli)	
Tenebrionidae			
<i>Cteniopus sulphureus</i> (L.)	Nb		
<i>Lagria hirta</i> (L.)			

Heteroptera, and the species counts were 35 and 17, respectively. Three species of Orthoptera, two of Diptera, four molluscs and two woodlice were also noted. The full species lists for the site are presented in Table 1. One species of Red Data Book (RDB) status and eight of Nationally Scarce status were found. Flea beetles (Chrysomelidae) and weevils (Curculionidae) provided the main interest amongst the beetles, while seed bugs (Lygaeidae) were prominent amongst the Heteroptera.

The key find was the RDB listed flea beetle *Ochrosia ventralis* (Illiger), associated with bitter-sweet *Solanum dulcamara*, and plentiful at this site. This has been known in Cornwall from a number of sites despite the county not featuring in the species account in Hyman & Parsons (1992). One Nationally Scarce species was also found to be plentiful here, *Mantura rustica* (L.), associated with broad-leaved docks *Rumex* spp on sandy soils. Two local species were also found: *Longitarsus pellucidus* (Foudras), which feeds on *Convolvulus arvensis* in ruderal situations, and *Psylliodes cuprea* (J.D.W. Koch) associated with hedge mustard *Sisymbrium officinale* and other Cruciferae.

The key finds amongst the weevils were large populations of the Nationally Scarce *Sirocalodes quercicola* (Paykull) and *Stenocarus ruficornis* (Stephens), as well as the presence of *Gymnetron rostellum* (Herbst). *Sirocalodes quercicola* is a particularly rare species nationally and which feeds on fumitories *Fumaria* spp, especially common fumitory *F. officinalis* (Hyman & Parsons, 1992) where it grows in disturbed soils. Common fumitory and common ramping-fumitory *F. muralis* both occur widely here as well as rarer ramping-fumitory species (Meredith, 2003) – one wonders if the entomologists who recorded the particular plant on which they have found the weevil were sufficiently good botanists to be able to distinguish these difficult fumitories successfully. Is such fumitory rich habitat a clue to the occurrence here of such a rare weevil? *Gymnetron rostellum* is also a rare species of disturbed soils, thought to be associated with mayweeds *Matricaria* spp, cudweed *Filago* and possibly speedwell *Veronica* spp (Hyman & Parsons, 1992). *Stenocarus ruficornis* is more widespread, the larvae developing in the roots of poppy species growing in disturbed soils, especially common poppy *Papaver rhoeas*. Neither *S. quercicola* nor *S. ruficornis* have been reported in the county since they were listed in the *Victoria County History* in 1906 (information from the Environmental Records Centre for Cornwall and the Isles of Scilly).

Aphanus rolandri (L.) is the most interesting of the bugs found. Arable land is a typical situation for this Nationally Scarce species although it is not confined to the situation. The key habitat features are given by Kirby (1992a) as: sunny, sheltered and well-drained, with a covering of dry leaf litter. It is not known which seeds it feeds on. The other Nationally Scarce bug found *Scolopostethus pictus* (Schilling) is mostly associated with stacks of dried plant material, particularly corn-stacks. It seems to favour base-rich sites (Kirby, 1992a). This is the first record for *A. rolandri* in Cornwall since 1956 (Alexander, 1997) while there is just one old unpublished record for *S. pictus* (S. Judd, pers. comm.). The third seed bug found *Megalonotus emarginatus* (Rey) is an uncommon species with only three previous records in the county (Judd, 1998).

Ground beetles (Carabidae) were disappointing although more species might be apparent at other times of the year. The presence of the local southern coastal species *Harpalus attenuatus* Stephens probably reflects the sparsely-vegetated sandy soils of this coastal headland rather than arable *per se*. Two of the other Nationally Scarce species present, the beetle *Cteniopus sulphureus* (L.) and the spurge bug *Dicranocephalus agilis* (Scopoli) are also primarily coastal species and are present here because of its situation and structural content rather than its arable habitat *per se* and both are local but widespread in the county. The bug *Chorosoma schillingi* (Schummel) and the mollusc fauna also fit into this category – wrinkled snail *Candidula intersecta* (Poiret), pointed snail *Cochlicella acuta* (Müller) and sandhill snail *Theba pisana* (Müller) all have a coastal distribution in the county.

The presence of larvae of painted lady *Vanessa cardui* (L.) on borage *Borago officinalis* in these fields has been reported elsewhere (Alexander, 2003).

BIODIVERSITY IMPLICATIONS

The rich findings from a single day's recording in July suggest that this particular site is of great interest for invertebrates that are able to exploit the special conditions provided by a species-rich arable system, and that further recording would be well worthwhile, particularly at other times of year when a different suite of species might be expected to be active. The invertebrate fauna of arable fields is a very neglected area other than in the pest control industry. It is instructive that Kirby (1992b) only covers the conventional semi-natural habitats so beloved of nature conservationists. There is not even a miscellaneous section covering other features of the cultural landscape. Fry & Lonsdale (1991) do cover these other aspects to some extent and include two pages on arable fields—in comparison with twenty on open grasslands. There appears to be no review of the special interest of arable land for invertebrates. Conservation research on arable invertebrates has tended to focus on their role as biomass for birdlife, and especially game birds (Donald, 1998; Boatman & Stoate, 1999). Nevertheless, these broad studies have been able to demonstrate that there are long-term trends of decreases in abundance of a wide range of invertebrate orders.

The habitat is not adequately covered by the UK Biodiversity Action Plan (BAP) (www.ukbap.org.uk). Cereal Field Margins (CFM) are a Priority Habitat but not the arable crop itself. The emphasis is very much on managing the margins to benefit wildlife without having a detrimental effect on the remaining cropped area. This is like allowing the core of ancient woodlands to be managed for conifer crops while protecting only the wood edge! The CFM Habitat Action Plan mentions that some 2000 species of invertebrates are commonly found in cereal fields but provides no breakdown on their conservation significance. It goes on to provide more detailed information about rare arable flowers and states that they are of conservation concern because of enormous national declines in their distribution and abundance. Overall, some 300 species of vascular plant can occur in arable fields, it states—vascular plant species are clearly much less significant than invertebrates in cereal fields and yet get all of the detailed attention.

Conservation in field margins may well be the most sensible way forward for conserving arable communities at landscape scale without having significant impact on agricultural cropping but this does not mean that the conservation of rare arable invertebrates should be overlooked. Interestingly, some of the rare arable plants known to be present at West Pentire are amongst the Priority Species in the UK BAP, including the two ramping-fumitories *Fumaria occidentalis* and *F. purpurea*. The inclusion of these arable plants as BAP species should help ensure conservation of extensive arable habitat. But it is not these plant species which are host to the rare invertebrates—these are dependent on host plants which are much more widespread. Choosing sites for special conservation measures based on rare vascular plants will not necessarily result in conservation of the rare invertebrates. The West Pentire example does suggest, however, that the underlying reasons why the rare plants have survived at this particular site may be the same or similar for the rarer invertebrates.

While it is possible for a few sites such as West Pentire to be managed as a nature reserve, true landscape scale conservation of these assemblages must be achieved mainly within the conventional farming system. Agri-environment schemes provide useful mechanisms for this but the key thing that is needed is a change of image, for arable plants and insects to be seen as part of our heritage by the people who farm the land, for them to be part of the products of land management, not an embarrassment and a nuisance.

ACKNOWLEDGEMENTS

Simon Ford was Property Manager North Cornwall for the National Trust until 2003 and was a key player in establishing the arable plant reserve. Thanks also to Ian Kemp, current Property Manager, for permission to carry out the invertebrate survey. Phil Wilson and Rose Murphy first drew attention to the great botanical interest of the fields. Hazel Meredith is a local volunteer botanist who monitors the plant interest. Janet Lister, Regional Nature Conservation Adviser for the National Trust also provided some background information.

Thanks to Mike Cox for help with Chrysomelidae and Peter Hodge with Ceuthorrhynchinae.

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BOOK REVIEW

Living Jewels by P. Beckmann. (Prestel Publishing, London, 2004). 12pp. Hard cover £24.99. ISBN 3-7913-2528-0.

This is another book in the Prestel series on insects as art and consists of approximately 100 large beautiful colour photographs of beetles. Species selected are the large and beautiful with a high preponderance of tropical scarabaeids and cerambycids and not a dull staphylinid in sight. The author, Poul Beckmann is a printer and photographer with an interest in jewellery design as is his collaborator Ruth Kaspin, who prepared the insects for close-up studies. My favourite beetle is a challenge, not only because of its name, *Julodis hirtiventris sanguinipilig*, but because it has orange-tufted elytra and appears to use a mix of coleopterous and lepidopterous wing patterns, suggesting there is a commonality of gene expression in the imaginal 'discs' of the two Orders. A book to enjoy over a nice cup of organic coffee.

JOHN BADMIN